# Injectable Macroporous Matrices to Enhance Stem Cell Engraftment and Survival

## Grant Award Details

Injectable Macroporous Matrices to Enhance Stem Cell Engraftment and Survival

**Grant Type:** Tools and Technologies III

**Grant Number:** RT3-07804

**Project Objective:** To validate the efficacy of microribbon-like hydrogels as cell-delivery matrices that enhance the engraftment and survival of human adipose-derived stem cells (ASC).

**Investigator:**

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| **Name:** | Fan Yang |
| **Institution:** | Stanford University |
| **Type:** | PI |

**Disease Focus:** Bone or Cartilage Disease

**Human Stem Cell Use:** Adult Stem Cell

**Award Value:** $1,438,200

**Status:** Active

## Progress Reports

**Reporting Period:** Year 1

**View Report**

## Grant Application Details

**Application Title:** Injectable Macroporous Matrices to Enhance Stem Cell Engraftment and Survival

**Public Abstract:** Despite the great promise stem cells hold for regenerative medicine, the efficacy of stem cell-based therapies is greatly limited by poor cell engraftment and survival. To overcome this major bottleneck, the goal of this proposal is to validate the efficacy of novel microribbon (μRB)-based scaffolds for cell delivery. These scaffolds combine the injectability and cell encapsulation of conventional hydrogels with macroporosity, which facilitates nutrient transfer, cell survival, proliferation, and tissue formation. In preliminary studies, our μRB-based scaffolds markedly enhanced the survival of human stem cells and accelerated bone repair in vivo. Thus, here we propose to validate the efficacy of μRB-like hydrogels with tunable stiffness and macroporosity as cell-delivery matrices that enhance the engraftment and survival of stem cells for both soft and hard tissue reconstruction using relevant animal models in vivo. Our results will significantly accelerate clinical translation of stem cell-based therapy by enhancing cell delivery, survival, and integration, thus improving therapeutic outcomes, reducing the number of cells needed for transplantation, and reducing the associated time and cost to produce these cells. Our validated platform will be broadly applicable to diverse cell types, and its wide dissemination will crucially advance the translation of stem cell-based therapies to combat both acute and degenerative human conditions

**Statement of Benefit to California:** Tissue loss and organ failure represents a substantial socioeconomic burden to the State of California, with increasing medical costs for treating patients suffering from various degenerative disease, trauma and congenital defects. Furthermore, the average life-span and percentage of aging population in California is expected to grow, with increasing needs for better therapeutic strategies for caring these patients. Stem cell-based therapies hold great promise for treating tissue loss and enhancing tissue regeneration, often via direct injection of cells at the target site. However, the majority of transplanted cells die shortly after transplantation, which greatly diminishes the efficacy of stem cell-based therapies. Poor cell engraftment and survival remain a major bottleneck to fully exploiting the power of stem cells for regenerative medicine. Here we propose to validate the efficacy of novel μRB-like hydrogels as cell-delivery matrices that enhance the engraftment and survival of stem cells for both soft and hard tissue reconstruction. Our results will significantly accelerate clinical translation of stem cell-based therapy for residents in California by enhancing cell delivery, survival, and integration, thus improving therapeutic outcomes. Our validated platform will be broadly applicable to diverse cell types, and its wide dissemination will crucially advance the translation of stem cell-based therapies to combat both acute and degenerative human conditions.

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